Attachment B

Extent of Paper Residuals in Channel

Subject:	Extent of Paper Residuals in Former Powerhouse Channel
Objective:	1. To determine the extent of residuals in the former powerhouse discharge channel by reviewing information available from previous investigations and combining it with the recent data collected during the Bathymetry and Visual Sediment Assessment. 2. To determine water depths at various transects throughout the former powerhouse channel and total volume. 3. To estimate sediment depth at various locations within the former powerhouse channel and total sediment volume.
Approach:	■ Perform bathymetric assessment of the powerhouse channel adjacent to the 12th Street Landfill by measuring water depth to top of sediment every 25 feet along eight transects along the east edge of the landfill. ■ Estimate sediment thickness at each water depth location by pushing clear lexan tubes into the sediment until refusal. ■ Conduct a visual reconnaissance of sediments collected at selected locations to identify the presence of visible residuals. ■ Prepare a figure detailing the presence of residuals, water depth contours, and estimated sediment thickness in the former powerhouse discharge channel adjacent to the landfill. ■ Refine the current estimate of the quantity of historical residuals present in the former powerhouse discharge channel.
Outcome:	Previous investigations have determined that residuals exist within the former powerhouse discharge channel adjacent to the 12th Street Landfill and extend to approximately 25 feet from the bank. In addition, a small pocket of residuals has also been previously identified near the center of the channel (Figure B-1). This visual assessment of the sediment types utilized a total of 16 sediment cores or ponar samples to confirm and refine the extent of residuals further into the channel. The residuals along the 12th Street Landfill and near the center of the channel were still present. A total of 59 probes were advanced to estimate sediment thickness across the channel. The average sediment thickness, within the excavation area, was 0.4 feet with a total volume of approximately 300 to 500 cubic yards of sediment at the time of the survey. A bathymetry survey including 59 water depth measurements were made to determine the channel depth and contouring. Results indicated that the channel depth varied from 0.5 to 3.5 feet deep in the area of interest with the deepest portion of the channel existing near the bank of the 12th Street Landfill. The average channel depth, within the targeted excavation area, was 2.3 feet with a total volume of approximately 370,000 gallons of water at the time of the survey.

Background and Objectives

The 2001 United States Environmental Protection Agency (USEPA)-issued Record of Decision (ROD) for the 12th Street Landfill included as one of its eleven major components relocation of residuals present in the powerhouse channel to the landfill and construction of an erosion control system protective of a 500-year flood event. As part of the 2007 Time Critical Removal Action (TCRA), the Kalamazoo River will be rerouted through the former powerhouse channel, impacting the paper residuals currently present.

In 2001, BBL performed an investigation of residuals within the former powerhouse channel at 22 locations along seven different transects. The sample locations extended an average of 60 feet from the bank with a maximum of approximately 70 feet. The investigation documented the presence of residuals along the edge of the 12th Street Landfill with an isolated pocket near the center. Twenty-nine samples were collected from seventeen different locations and sent for PCB analysis. Additional samples were collected, but if residuals were visible, were not analyzed for PCBs. A summary of the PCB results and locations are presented in Figure B-1.

The USEPA collected a number of samples in 2003 to investigate the extent of waste associated with the 12th Street Landfill. Samples were located on shore as well as at 15 locations sporadically throughout the channel. Sample results were consistent with those obtained by BBL in 2001, both in concentration and extent of residuals in the channel (Figure B-1).

The objectives of this assessment are as follows:

1. To determine the extent of residuals in the former powerhouse discharge channel by reviewing information available from previous investigations and combining it with additional data collected during this Bathymetry and Visual Sediment Assessment.
2. To determine water depths at various transects throughout the former powerhouse channel.
3. To estimate sediment depths at various locations within the former powerhouse channel.

Bathymetric and Visual Sediment Assessment

The purpose of the bathymetry and visual sediment assessment was to determine the water depth, sediment depth, and visible paper residuals content so that the sediment removal design could be completed. Water depth and sediment characteristics were needed for the design of a water control system to isolate the sediment adjacent to the landfill from the rest of the river. Visual observations of the sediment within the powerhouse channel were used to identify the obvious paper residuals to allow an estimate of removal quantities needed in the design.

The findings of the visual sediment assessment were used to confirm the extent and presence of residuals previously recorded in other investigations. A grid-based sampling plan (see Figure B-2) was proposed in the approved Bathymetry and Visual Sediment Assessment Data Quality Objectives and Work Scope and used as the basis for the sampling locations. Sample locations were selected to obtain information on the grain size of surface sediment along the proposed alignment of the Portadams and to confirm and supplement previous sediment quality information. Sediment samples were collected for visual assessment of residuals by advancing a piston core sampler into the sediment until refusal. If a sample could not be collected, a ponar sampler was used to collect and identify sediment. A total of 16 sediment cores or ponar samples were collected to confirm locations with residuals from the prior assessments and to target areas farther into the channel where historical

data were not available. Table B-1 presents a summary of the coring log indicating the collection method, the length of core recovery, and sediment types observed at each location.

Paper residuals were identified at four of the sixteen locations ranging in thickness from 0.1 to 0.3 feet. Figure B-2 identifies the locations of the sixteen sample locations and also highlights those locations where residuals were present. Figure B-3 presents a summary of all visual data collected to date and identifies the location of residuals within the channel.

The channel bathymetry and sediment thickness was determined by use of a round 2-inch diameter PVC pipe, 10 feet in length, with markings delineating every foot. Determination of water depth was completed by slowly advancing the PVC pipe vertically into the water until the sediment surface was reached, at which time the spot depth was recorded. The sediment depth was then obtained by physically advancing the PVC pipe into the sediment until refusal. Water depth and sediment thickness was determined at 59 locations within the channel. Figure B-4 presents an output of estimated water depth and thickness within the channel based upon these measurements.

Findings and Conclusions

Previous investigations identified residuals at eight locations and have determined that residuals exist within the former powerhouse discharge channel adjacent to the 12th Street Landfill and extend approximately 25 feet from the bank. Near the center of the channel, a small pocket of residuals has also been previously identified (Figure B-1). The visual assessment of the sediment types reported in this memo utilized a total of sixteen sediment cores or ponar samples to confirm and refine the extent of residuals further into the channel. This reconnaissance confirmed the presence of residuals along the 12th Street Landfill and also showed that the previously identified pocket of residuals near the center of the channel is still present (Figure B-4). A total of 59 probes were advanced to estimate sediment thickness across the channel. The average sediment thickness within the excavation area was 0.4 feet. The measured sediment thicknesses and surveyed sample locations were input into a CADD-based computer software Surfer program. The estimated quantity of soft sediments and residuals within the former powerhouse channel adjacent to the 12th Street Landfill was approximately 300 to 500 cubic yards of material above the natural channel base elevation.

A bathymetry survey including 59 water depth measurements was conducted to determine the channel depth and contour. Results indicated that the channel depth varied from 0.5 to 3.5 feet deep in the area of interest with the deepest portion of the channel existing near the bank of the 12th Street Landfill. At the time of the survey, the average channel depth was 1.4 feet with a total volume within the channel between the 12th Street Landfill and the small point between the dam and the spillway was approximately 880,000 gallons of water.

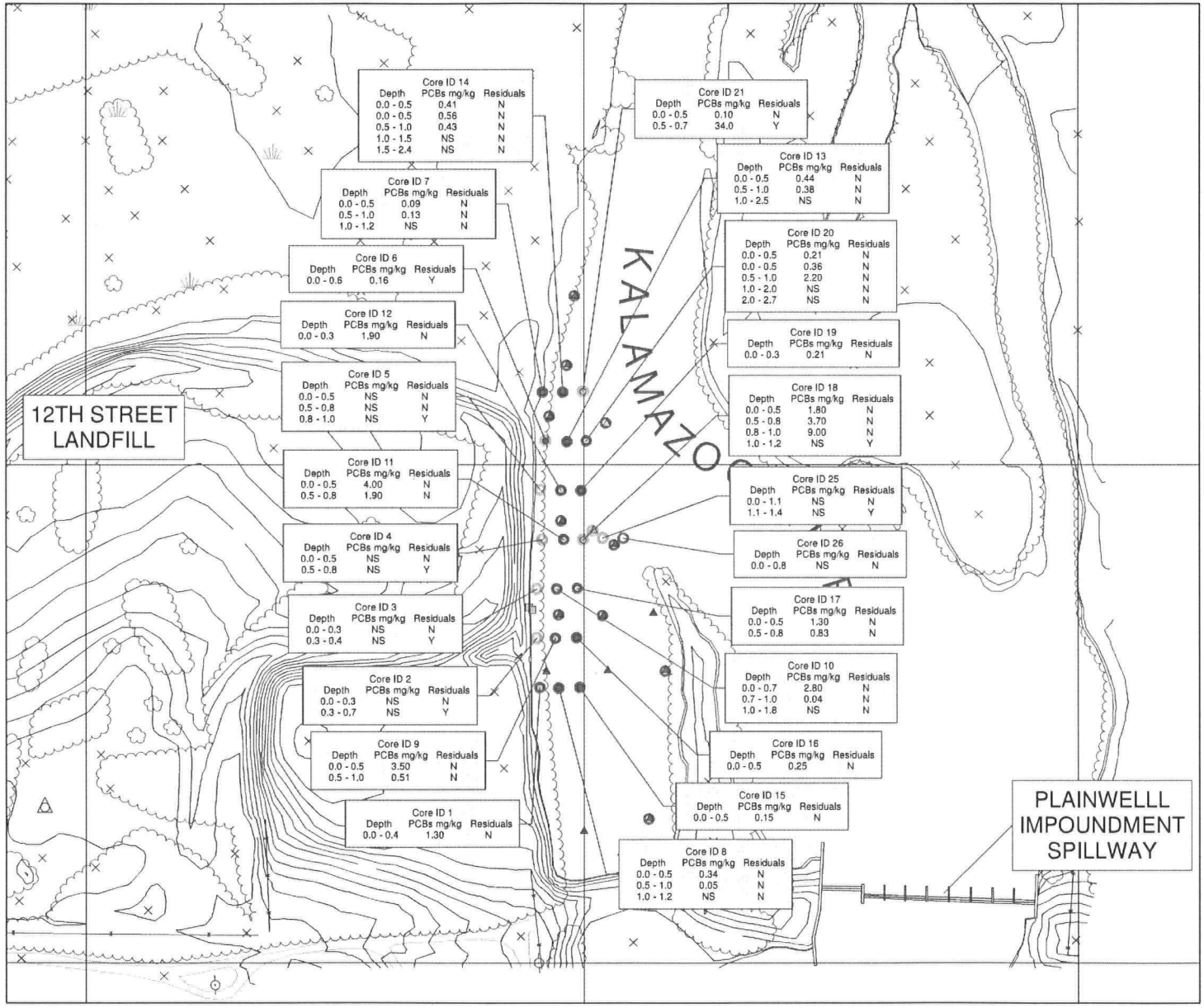
Table B-1
Sample Location and Sediment Description

Location ID and Sample Equipment	Depth Range (ft)	Sediment Description
1 – Piston Core	0.0 to 0.7	Fine Gravel and Sand
	0.7 to 0.9	Sand and Silt (50-50 mix)
	0.9 to 2.0	Dark Gray Sandy Silt
	2.0 to 2.1	Brown Sandy Silt

Location ID and Sample Equipment	Depth Range (ft)	Sediment Description
2 – Piston Core	0.0 to 0.6	Dark Gray Sandy Silt
	0.6 to 0.9	Sand Silt with traces of light gray
	0.9 to 1.1	Mixture of Sand, Silt and Gray Material (potential paper residuals)
3 – Piston Core	0.0 to 0.6	Dark Gray Silty Sand
4 – Ponar Sample	0.0 to 0.5	Sandy silt with Brown Sand and Black Silt
5 – Piston Core	0.0 to 0.1	Very Fine Silt with High Water Content
	0.1 to 0.4	Silty Sand with Some Gravel
6 – Ponar Sample	0.0 to 0.5	Dark Gray with Fine Silt and Trace Sand
7 – Ponar Sample	0.0 to 0.5	Dark Gray with Fine Silt and Trace Sand
8 – Ponar Sample	0.0 to 0.5	Very Fine Silt Black with High Water Content
9 – Piston Core	0.0 to 0.2	Gray Sandy Silt
	0.2 to 0.3	Paper Residuals
11 – Ponar Sample	0.0 to 0.5	Black Silt with some Organics and Trace Sand
12 – Piston Core	0.0 to 0.5	Dark Gray Silty Sand with Organics (Leaves)
	0.5 to 1.3	Brown Sand
13 – Piston Core	0.0 to 0.2	Sand with some Gravel and Organic Matter (Dark Brown) also some Silt
14 – Piston Core	0.0 to 0.6	Dark Gray Fine Silt, No Grains and High Water Content (Trace Sand near 0.6')
15 – Piston Core	0.0 to 0.2	Black Silt with Trace Sand
	0.2 to 0.7	Brown to Gray Sandy Silt
	0.7 to 0.9	Paper Residuals (Light Gray and Clay Like)
16 – Piston Core	0.0 to 0.5	Dark Gray Silt with Trace Sand and High Water Content
	0.5 to 0.8	Light Gray Paper Residuals
17 – Piston Core	0.0 to 0.1	Black Gravel with Silt
18 – No Recovery	---	No Recovery 4"-6" Rubble Visible at Sediment Surface

Notes:

1. If no recovery with the piston core sampler, the ponar sampling equipment was used for sample collection.
2. Ponar samplers typically recover shallow sediments from 0.0 to 0.5 feet, actually sediment thickness may be less.



LEGEND

BBL Data (2001) - Total PCBs mg/kg (USEPA, 2004)

- 0 - 1
- 1 - 4
- 4 - 50
- 50+

USEPA Data 2004 - Total PCBs (mg/kg)

- 0 - 1
- 1 - 4
- 4- 50
- 50+

Geraghty and Miller (1994) - Total PCBs (mg/kg)

- PCB Concentration 17 & 29 ppm

Powerhouse Channel Residuals

- No Visible Residuals
- Visible Residuals

NOTE

1. Concentrations presented are maximum at each sample location.

N

0 40 80 160 FEET

1:1,200

1 INCH EQUALS 100 FEET

PROJECT: WEYERHAEUSER COMPANY
12TH ST. LANDFILL EMERGENCY ACTION DESIGN REPORT
PLAINWELL, MICHIGAN

SHEET TITLE: HISTORICAL SAMPLING DATA FOR THE FORMER POWERHOUSE DISCHARGE CHANNEL

DRAWN BY:	WEBERN	SCALE: AS NOTED	PROJ. NO.: 00-05117.03
CHECKED BY:	MK		FILE NO.: 51170312.mxd
APPROVED BY:	CJ	DATE PRINTED: 07/16/07	FIGURE B-1
DATE:	JULY 2007		

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Brookfield, WI 53045-5854
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Fax: 262-879-1220

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LEGEND

Visual Sediment Assessment

- No Visible Residuals
- Visible Residuals
- Piston Core or Ponar Sample Location & ID

N

0 25 50 100 FEET

1:800

1 INCH EQUALS 67 FEET

PROJECT:	WEYERHAEUSER COMPANY 12TH ST. LANDFILL EMERGENCY RESPONSE DESIGN REPORT PLAINWELL, MICHIGAN
SHEET TITLE:	RECENT VISUAL ASSESSMENT OF FORMER POWERHOUSE DISCHARGE CHANNEL SEDIMENTS

DRAWN BY: HANKLEY C.	SCALE: AS NOTED	PROJ. NO.: 00-05117.03	
CHECKED BY:		FILE NO.: 51170314.mxd	
APPROVED BY:	DATE PRINTED: 7/16/07	FIGURE B-2	
DATE: JULY 2007			

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Fax: 262-879-1220

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LEGEND

Powerhouse Channel Residuals

- No Visible Residuals
- Visible Residuals

N

0 25 50 100 FEET

1:800

1 INCH EQUALS 67 FEET

PROJECT: WEYERHAEUSER COMPANY 12TH ST. LANDFILL EMERGENCY ACTION DESIGN REPORT PLAINWELL, MICHIGAN			
SHEET TITLE: VISUAL EXTENT OF RESIDUALS WITHIN THE FORMER POWERHOUSE CHANNEL (FIGURE INCLUDES ALL HISTORICAL DATA)			
DRAWN BY: HANKLEY C	SCALE: AS NOTED	PROJ. NO.: 00-05117.03	
CHECKED BY:		FILE NO.: 51170313.mxd	
APPROVED BY:	DATE PRINTED: 7/16/07	**FIGURE B-3**	
DATE: JULY 2007			

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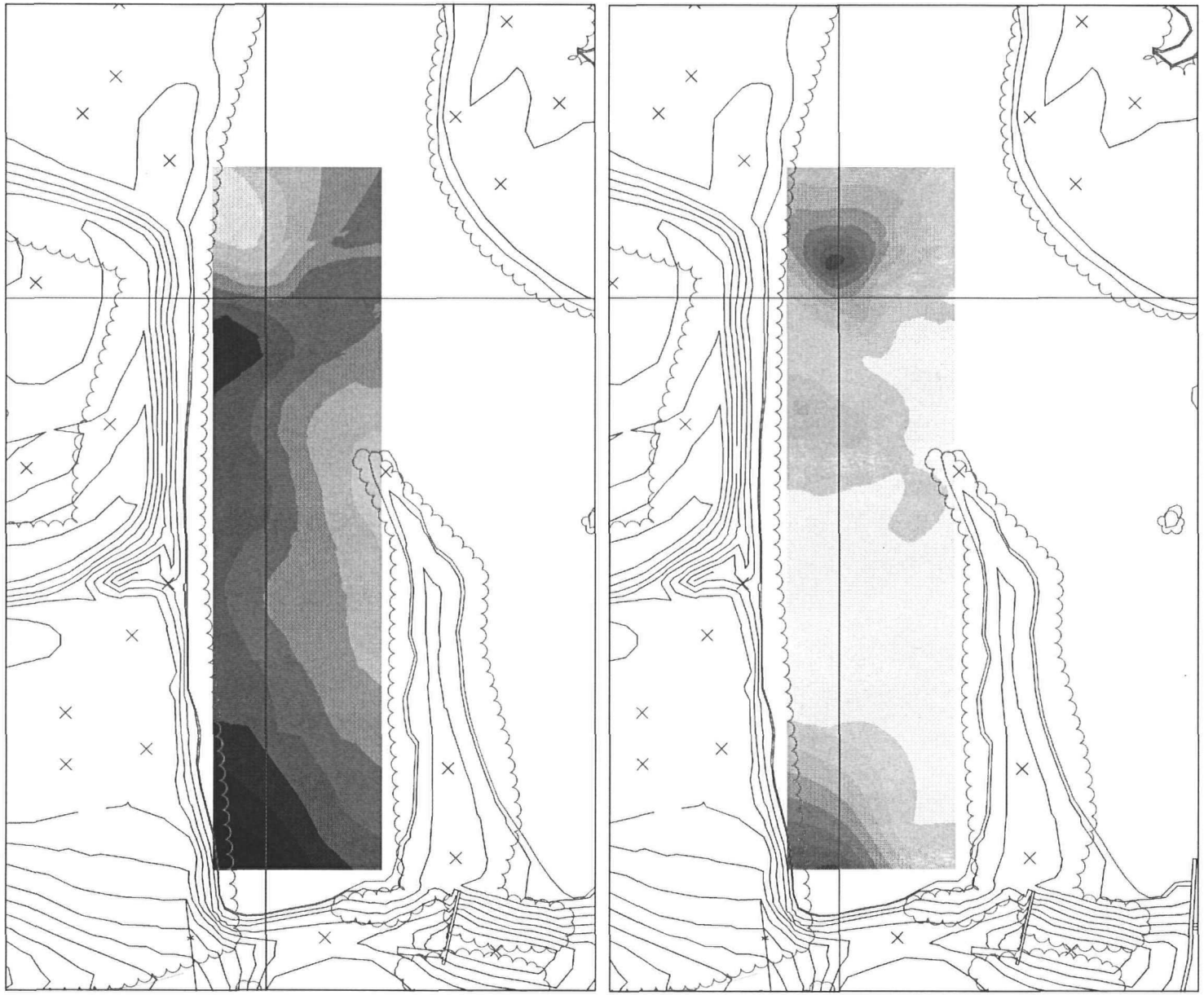

LEGEND

Water Depth (ft)	Sediment Thickness (ft)
0 - 1.3	0 - 0.3
1.4 - 1.7	0.4 - 0.5
1.8 - 2.1	0.6 - 0.7
2.2 - 2.4	0.8 - 0.9
2.5 - 2.8	1 - 1.1
2.9 - 3.2	1.2 - 1.4
3.3 - 3.5	1.5 - 1.6
3.6 - 3.9	1.7 - 1.8
4 - 4.3	1.9 - 2

N

0 25 50 100 FEET

1:800

1 INCH EQUALS 67 FEET

PROJECT: WEYERHAEUSER COMPANY
12TH ST. LANDFILL EMERGENCY ACTION DESIGN REPORT
PLAINWELL, MICHIGAN

SHEET TITLE:
APPROXIMATE WATER DEPTH AND SEDIMENT THICKNESS
FORMER POWERHOUSE DISCHARGE CHANNEL

DRAWN BY:	WEBERN	SCALE: AS NOTED	PROJ. NO.: 00-05117.03
CHECKED BY:	MK		FILE NO.: 51170315.mxd
APPROVED BY:	CJ	DATE PRINTED: 06/19/07	FIGURE B-4
DATE:	JULY 2007		

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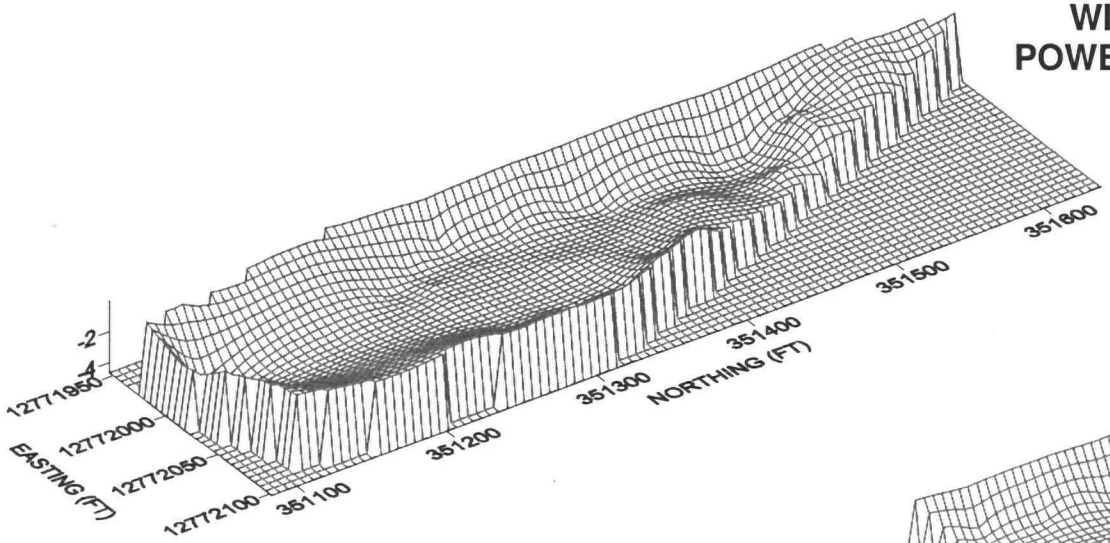
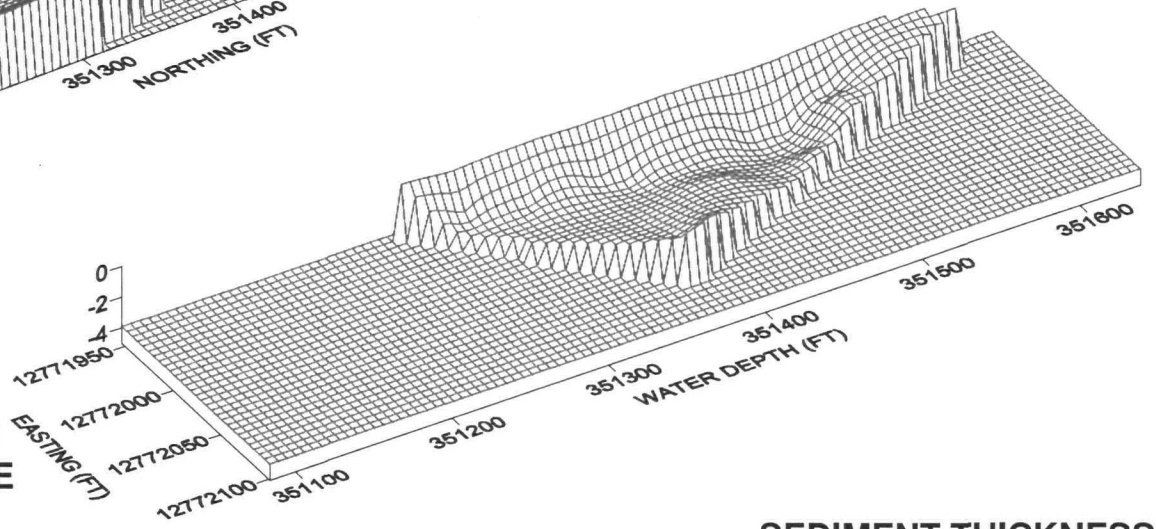
WATER DEPTH (FT)
WITHIN THE FORMER
POWERHOUSE DISCHARGE
CHANNEL





WATER DEPTH (FT) WITHIN
THE FORMER POWERHOUSE
DISCHARGE CHANNEL
[EXCAVATION AREA ONLY]

SEDIMENT THICKNESS (FT)
WITHIN THE FORMER
POWERHOUSE DISCHARGE CHANNEL
[EXCAVATION AREA ONLY]

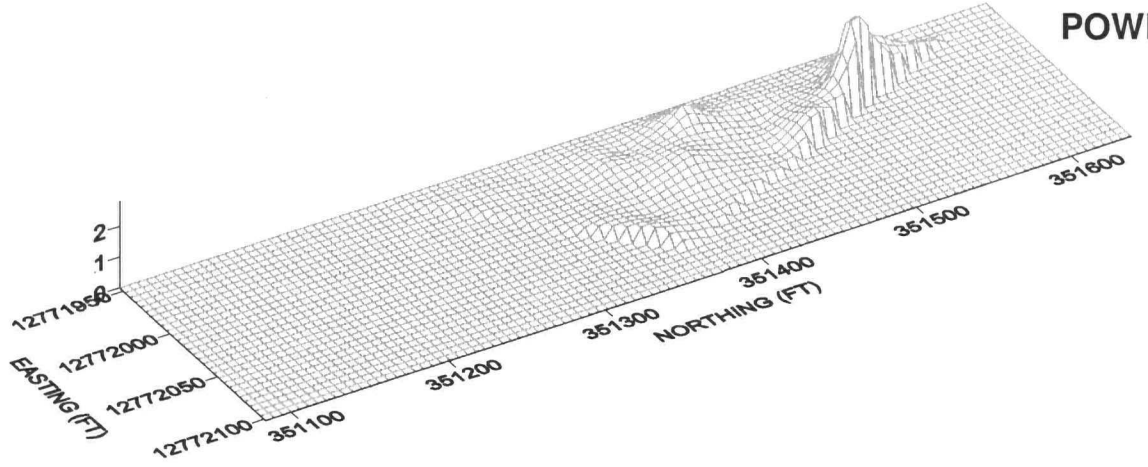


FIGURE B-5

Grid Volume Computations

Wed Jul 25 12:20:43 2007

Upper Surface

Grid File Name:	C:\Documents and Settings\WEBERN\Desktop\sedimenttop.grd
Grid Size:	100 rows x 29 columns
X Minimum:	12771946.59
X Maximum:	12772101.65
X Spacing:	5.5378571428758
Y Minimum:	351083.6461
Y Maximum:	351638.2703
Y Spacing:	5 6022646464643
Z Minimum:	-3.9252274630163
Z Maximum:	0.013853365149562

Lower Surface

Grid File Name:	C:\Documents and Settings\WEBERN\Desktop\sedimentbottom.grd
Grid Size:	100 rows x 29 columns
X Minimum:	12771946.59
X Maximum:	12772101.65
X Spacing:	5.5378571428758
Y Minimum:	351083.6461
Y Maximum:	351638.2703
Y Spacing:	5.6022646464643
Z Minimum:	-4.2236233678412
Z Maximum:	0.031501310421555

Volumes

Z Scale Factor:	1

Total Volumes by:

Trapezoidal Rule:	7894.8830700963
Simpson's Rule:	7864.043990993
Simpson's 3/8 Rule:	7884.1891254355

Cut & Fill Volumes

Positive Volume [Cut]:	7895.2920573373

Negative Volume [Fill]:	0.40898724093838
Net Volume [Cut-Fill]:	7894.8830700963

Areas

Planar Areas

Positive Planar Area [Cut]:	21170.257512428
Negative Planar Area [Fill]:	3.9919171116185
Blanked Planar Area:	64825.779022744
Total Planar Area:	86000.028452283

Surface Areas

Positive Surface Area [Cut]:	21178 421459426
Negative Surface Area [Fill]:	3.9931393133334

Grid Volume Computations

Wed Jul 25 12:20:02 2007

Upper Surface

Level Surface defined by Z = 0

Lower Surface

Grid File Name:	C:\Documents and Settings\WEBERN\Desktop\waterdepth.grd
Grid Size:	100 rows x 29 columns
X Minimum:	12771946.59
X Maximum:	12772101.65
X Spacing:	5.5378571428758
Y Minimum:	351083.6461
Y Maximum:	351638.2703
Y Spacing:	5.6022646464643
Z Minimum:	-3.9252274630163
Z Maximum:	0.013853365149562

Volumes

Z Scale Factor: 1

Total Volumes by:

Trapezoidal Rule:	49306 811309313
Simpson's Rule:	49303.688233496
Simpson's 3/8 Rule:	49352.964935481

Cut & Fill Volumes

Positive Volume [Cut]:	49307.152055523
Negative Volume [Fill].	0.34074621022795
Net Volume [Cut-Fill]:	49306.811309313

Areas

Planar Areas

Positive Planar Area [Cut]:	21169.478295515
Negative Planar Area [Fill]:	4.7711340247994
Blanked Planar Area:	64825.779022744
Total Planar Area:	86000.028452283

Surface Areas

Positive Surface Area$_1$[Cut]: 21221.065466751
Negative Surface Area [Fill]: 4.7722206121834